National Wind Tunnel Facility

Indian Institute of Technology, Kanpur

Enquiry No., NWTF/IITK/2017-18/02

Enquiry Date: April 19,2017;Closing Date: May 5, 2017 * Date Extended till May 20,2017

Tender Inquiry for 1:55 model scale and full scale ship Hot plume dispersal

Sealed Quotations (price and technical specification are to be included in separate envelops) are invited from the reputed Vendors who have previous experience in carrying out work as per the specifications given below.

Vendor Qualification

Following validation case must be solved by the Vendor

1. Vendor should have the technical know-how to simulate ship structures
2. Vendor should possess requisite computing power to simulate large number of cases in 3.5 months' time
3. Vendor must have adequate number of licenses of CFD software and also the requisite parallel license to simulate such large structure. Vendor may have to demonstrate the license capability to solve 100 million mesh points
4. Vendor should be able to deliver the software as per the specs
5. Following validation case must be solved by the Vendor
6. Velocity of wind relative to ship $V_w = 10$ m/s
7. Velocity of smoke from exhaust is V_e and velocity factor $K = V_e/V_w$
8. Simulation to be done for $K = 1$ and 2
9. Wind direction exactly opposite to ship heading. Figure below explains the geometric construction of the ship. The simulation report should be submitted along with the tender
10. Please refer *Parametric studies of exhaust smoke–superstructure interaction on a naval ship using CFD, P.R. Kulkarni et al. / Computers & Fluids 36 (2007) 794–816*
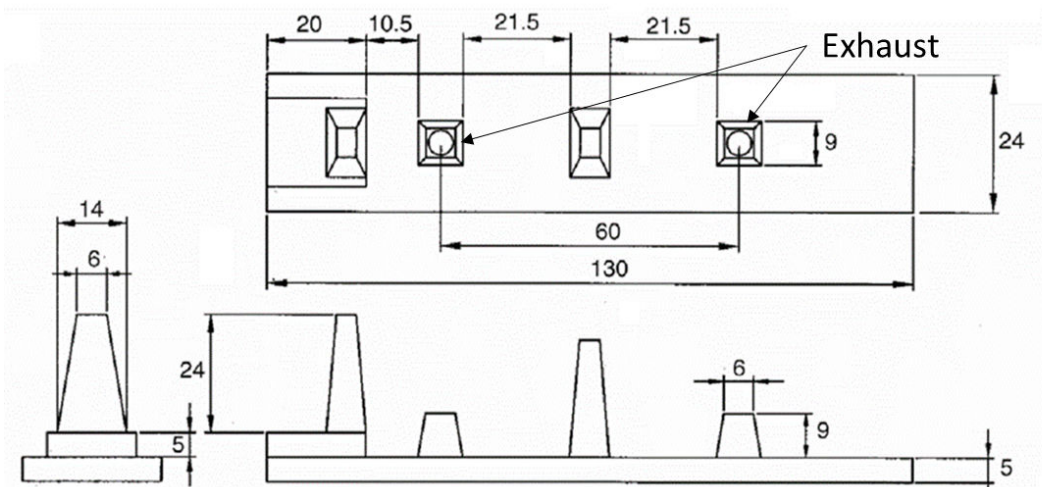

Figure 1: Dimensions of the ship superstructures

Tender Specifications

For "1:55 model scale and full scale ship Hot plume dispersal" are given below.

CFD studies for flow velocity, flow direction and temperature field predictions are required under required hot plume of required mass flow. CFD analysis for 25 cases will be done on a computer model of the same scale and for similar conditions as that of the wind tunnel model. Flow measurements and CFD analysis will be compared, and variations between the wind tunnel test results and the computer simulation prediction will be indicated and changes will be made in the CFD model for matching with the wind tunnel results.

Further, 25 cases will be computed using CFD for full scale for wind speeds 10, 20, 34.5 Knots and angle of yaw 0, 10, 20, 30, 60, 90, 120 and 180 degree. Aim is first to validate the code with wind tunnel measurements , and then carry out CFD at full scale Reynolds number.

The quote should be inclusive of:

1. Pre-processing: CAD model generation from 2D drawings or scan data, geometry clean-up etc.
2. Mesh independence study to resolve clustering and mesh density issues
3. Report on the mesh independence and best practices to be adopted
4. All the simulations as given in the matrix given in table 1.
5. Post-processing of simulation results as per IITK guidelines (to be given at the time of contract)
6. Report preparation and presentation of results

1. Inputs, Terms and Conditions

7. CAD data at full scale will be provided by IITK.
8. Exact testing conditions as used in the experiment will be provided for validation.
9. Any other data related to the test set-up and procedure will be given. However, the experimental results will be shared by IITK only after CFD results are received at IITK. CFD tuning needs to be done by the vendor.
10. All the data generated will be property of IITK. Data must be kept confidential.
11. In the tender, vendor must give details of the previous work carried out on temperature and flow field study using state of the art CFD techniques. Vendor should also give details of the team that will carry out the work for IITK to technically evaluate the tender.

2. Outputs and Deliverables

Following output will be given by the Vendor

1. Validation report on the scaled model
2. CFD studies (25 cases) of full scale.
3. All the simulation files for validation (in standard CGNS format)
4. Mesh independence study report on full ship model
5. Report on all the simulations for full scale ship
6. Simulation files for all the full-scale ship simulations
7. CFD studies & validation through experimental results of scaled down (1:55) physical model. IIT Kanpur will share the experimental results for CFD validation.
8. One commercial license of parallel software to simulate full scale ship. This will be demonstrated at IITK by simulating one full scale case
9. Vendor needs to be available to explain the results to expert committee for a period of at least 6 months.

10. Vendor needs to present the results to review committee and successfully defend it for the acceptance.

3. Confidentiality, Terms and Conditions

1. Data in this project will be kept confidential. It may be required to sign an NDA with IITK at the time of the contract
2. Only employees working on the project should be allowed to access the confidential data
3. Vendor should make a secure server on its premises for transfer of data from IITK to vendor and vice versa

sealed quotations may be sent to:
The Coordinator,
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For all queries/ clarification the vendor may contact:
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